

ORIGINAL ARTICLE

Impact of ongoing COVID-19 pandemic on cytology: An institutional experience

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Abstract

Background: The ongoing COVID-19 pandemic has greatly impacted the health services worldwide, challenging the way modern medicine has been practiced for decades.

Aim: The present study documents an institutional experience on its impact on cytology services.

Materials & Methods: The cytology samples received during lock down period in India (24 March to 17 May 2020) were analysis and compared to the samples received during the same time frame in year 2019.

Results: The data revealed an overall 92.6% reduction in cytology samples received. All sample types were reduced with a statically significant reduction in thyroid cytology samples (P-value: .023). There was relative increase in breast and lymph node samples; however, this relative increase was not statistically significant. The malignancy rate also significantly increased by 34.1% accompanied by decrease in neoplastic category among the samples received during COVID-19 lockdown period. Breast samples remain the most frequent sample type both in pre-COVID-19 and COVID-19 periods. Majority of fine-needle aspiration done in these cases, during the lock-down period, were either in cases for recurrence or primary diagnosis.

Conclusion: Prioritization of samples, proper precautions and triaging of patients before procedure helped in carrying out this procedure safely.

KEYWORDS

COVID-19, cytology, pandemic

1 | INTRODUCTION

World has witnessed several disease outbreaks in 20th century starting from Spanish flu followed by some major pandemics, namely Asian flu, Hong Kong Flu, HIV, SARS, Swine Flu, MERS, Ebola with Corona virus being the latest and ongoing pandemic, also known as COVID-19 pandemic.^{1,2}

COVID-19 pandemic has been caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first identified in December 2019 in Wuhan, China, and had since spread globally,

resulting in an ongoing pandemic.³ As we write (25 May 2020, 17:29 GMT) there are 5 555 504 confirmed cases of COVID-19 with 348 141 deaths from 213 countries, affected worldwide.⁴ The first case of COVID-19 in India was reported on 30 January 2020 in the Kerala state and since then this number has increased to 144 741 confirmed cases with 4162 deaths, and the figures continues to increase with each passing day. To break the chain of transmission, the Indian Prime minister decided to take aggressive containment measures and hence a nationwide lock down was imposed on 24 March 2020.

This pandemic has led to considerable anxiety and panic not only in general public but also among healthcare professionals and has also challenged the way the modern medicine had been practiced for decades.⁵ Accordingly, our practice of cytopathology has changed too. To facilitate the working of laboratories, the executive committee of the Indian Academy of Cytologists has prepared guidelines for pre-analytical, analytical and post-analytical steps in cytopathology laboratory. These guidelines will provide guidance to the laboratories across India, in the best interests and safety of the laboratory personnel.⁵ Due to the potential presence of the virus in cytology specimens, nonessential fine-needle aspiration (FNA) cytology (screening and possibly benign) sampling was minimized along with prioritization of the high-risk oncological patients. Our institute played a major role in COVID-19 testing as well as patient care as it has been designated as COVID-19 Test Centre of Excellence by Indian Council of Medical Research.

This study aims to share our institutional experience in cytopathological evaluation during lockdown period and to analyze the difference in cytological practices and sampling as compared to the same period in 2019.

2 | MATERIAL AND METHODS

This is a retrospective descriptive study including the patient visiting to cytopathologist-run FNA clinic in Department of Pathology, King George's Medical University, for cytological evaluation during COVID-19 outbreak in India. The national lockdown period (24 March to 17 May 2020) was considered and all the cytology cases reported during this time frame were reviewed and designated as COVID-19 era samples. All the cytology cases reported during the same time interval in 2019 were also reviewed and labeled as pre-COVID-19 era samples. The demographic details were recorded from the case files and evaluated.

In both the groups, pre-COVID-19 and COVID-19, the total number of samples received were recorded and were distributed in five groups depending on their site, which were breast, thyroid, lymph node, salivary glands and others (soft tissue, body fluids etc.). The final diagnosis was also categorized into five categories: inadequate, non-neoplastic, benign neoplasm, malignant neoplasm and indeterminate. The neoplastic category included cases like fibroadenoma and phyllodes, while indeterminate categories included cases diagnosed as atypia of undetermined significance/follicular lesions of undetermined significance (AUS/FLUS), suspicious of follicular neoplasm, atypical probably benign, etc.

2.1 | Statistical analysis

Chi-square test for proportions and Fishers' exact test were used, wherever applicable, to test for variation in proportions between pre-COVID-19 era and COVID-19 era. *P*-value <.05 was considered statistically significant. All analysis was done using stata 14.1.

TABLE 1 Demographic details of patients in COVID-19 and pre-COVID-19 era

	Pre-COVID-19 era	COVID-19
Number of samples (n)	230	21
Age range (y)	13-74	22-65
Mean age (y)	38.2	45
Male (%)	27 (11.7%)	1 (4.8%)
Female (%)	203 (88.3%)	20 (95.2%)
Age wise distribution		
<20 years	26 (11.3%)	0 (0%)
21-40 years	111 (48.2%)	7 (33.3%)
>41 years	93 (40.5%)	14 (66.7%)

3 | RESULTS

There was 92.6% reduction in cytology samples processed in COVID-19 era when compared to pre-COVID-19 era (*n* = 21 vs *n* = 230). There was female predominance in both these groups. There was significant change (*P*-value .02) in the age group visiting for cytopathological evaluation, so that the majority of the patients visiting in COVID-19 era were older (>40 years) as compared to pre-COVID-19 era. FNA was not performed in any patient <21 years during COVID-19 era (national lockdown time 2020). Table 1 shows the detailed demographic variables (age, gender, etc.) in both the groups.

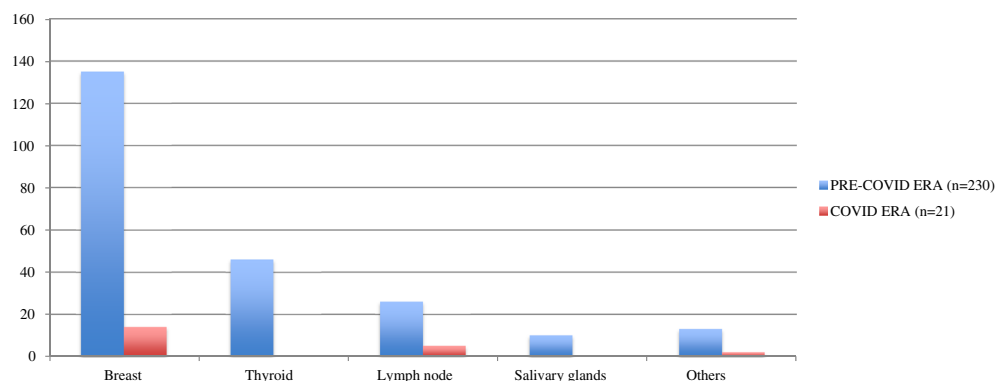
When the specimen type was considered there was a reduction in samples obtained from thyroid, salivary glands and other sites (soft tissue, fluid cytology, scrap smear, etc.). No cytology specimens from thyroid were obtained during the COVID-19 era and this reduction was significant with *P*-value of .023 (*n* = 46, 20% to *n* = 0, 0%). Similarly, there were no FNA done from salivary glands as well. Majority of the samples obtained during COVID-19 era were from breast (*n* = 14; 66.7%) and lymph nodes (*n* = 5; 23.8%) signifying a relative increase in their numbers (Table 2). Figure 1 shows distribution of samples in pre-COVID-19 and COVID-19 time frames.

Similarly, there was noticeable difference in distribution of the diagnostic categories relative to cytological samples processed during the national lockdown amid COVID-19 pandemic and same time period in 2019. This difference was statistically significant in malignant (*P*-value .001) and neoplastic (*P*-value .013) categories only. The benign nonneoplastic cases were reduced by 19.7% (38.7%-17.6%) with a minor decrease in intermediate category (2.2%). The major impact was seen on malignant category with a relative increase of 34.1% (27.8%-61.9%). The cases in benign and intermediate categories also reduced by 19.7% and 2.2%, respectively however, this decrease was not statistically significant (Table 2).

The main reasons for cytopathological evaluation during COVID era were for primary diagnosis of breast cancer (*n* = 11) followed by for evaluation of recurrence in known cases of breast cancer (*n* = 7) and evaluation of recurrence in known cases of phyllodes neoplasm (*n* = 2). Among these cases with recurrences, axillary lymph nodes were the most common site from which FNA was performed (*n* = 5). There were three

TABLE 2 Specimen type and diagnostic category distribution between COVID-19 (National lockdown period 2020) vs pre-COVID-19 era (same period in 2019)

	Pre-COVID-19 (n = 230)	COVID-19 (n = 21)	Difference (%)	P-value (two tailed)
Specimen type				
Breast	135 (58.7%)	14 (66.7%)	+08.0	.477
Thyroid	46 (20.0%)	00 (00.0%)	−20.0	.023
Lymph node	26 (11.3%)	05 (23.8%)	+12.5	.950
Salivary gland	10 (4.3%)	00 (00.0%)	−04.3	.329
Others	13 (5.7%)	02 (09.5%)	+03.8	.474
Diagnostic category				
Nonneoplastic	89 (38.7%)	04 (19.0%)	−19.7	.074
Benign neoplasm	53 (23.0%)	00 (00.0%)	−23.0	.013
Malignant neoplasm	64 (27.8%)	13 (61.9%)	+34.1	.001
Intermediate	05 (02.2%)	00 (00.0%)	−02.2	.495

FIGURE 1 Distribution of sample types in pre-COVID-19 and COVID-19 era [Color figure can be viewed at wileyonlinelibrary.com]**TABLE 3** Cases with cytological evaluation during COVID-19 era (2020) n = 21

Clinical reason for FNA	No. of patients	Site of FNA	Diagnosis
Infertility	1	Bilateral testes	Normal spermatogenesis
Recurrence	9		
(a) Known case of breast cancer	7	Axillary lymph node (5)	Metastatic carcinoma Axillary lymph node (n = 4)
		Surgical scar site (1)	Inadequate/nondiagnostic Axillary lymph node (n = 1)
		Pleural fluid (1)	Recurrence of invasive carcinoma breast scar site (n = 1)
			No atypical cell seen pleural fluid (n = 1)
(b) Known case of phyllodes neoplasm	2	Surgical scar site (2)	Recurrence of Phyllodes neoplasm (2)
Suspicion of breast cancer	11		Invasive carcinoma breast (9)
			Granulomatous mastitis (1)
			Inadequate (1)

cases were FNA was performed from the previous surgical scar site and one cases were pleural fluid was evaluated (refer Table 3 for details).

4 | DISCUSSION

As of 24 May 2020 corona confirmed COVID-19 cases rallied to 144 741 with 4162 deaths in India.⁴ India had been in lock down

since 24 March 2020 till 17 May. This lock down had been extended till 31 May 2020 with certain modifications.

The health care has undergone a major reform throughout the world with change in their functionality, as many countries had been forced to implement lockdown to break the chain of transmission of COVID-19. Our institute, being declared as center of excellence of corona testing and care, had been functional throughout with changes in its organization and practice.

Accordingly, our practice of cytopathology has also changed significantly. Due to the potential presence of the virus in cytology specimens, we adopted more stringent safety procedures, according to recent recommendations by Indian Academy of Cytologist.⁵ Several such recommendations have been given by agencies worldwide.⁶⁻¹⁰

Before performing FNA, all the patients were triaged for COVID-19 infection symptoms. None of our patients had any COVID-related symptoms or exposure history, hence FNA procedure was safely carried out. In addition, to mention none of our staff member or residents contracted the infection.

Although our FNA facility is running on daily basis, few tweaks were done in our routine cytopathology protocols, keeping in mind the scarcity of resources such as protective equipment. FNA timings were limited to few set hours, which were communicated to the concerned department; so that the procedure could be carried out in one go. Attendants were not allowed to accompany patients unless necessary. The patients were called one at a time from our holding area and FNA procedure was performed quickly to reduce exposure time. Resident performing the FNA wore a protective mask with an additional surgical mask and eye shield along with double layer of gloves, the upper one discarded after each FNA. History was taken telephonically and direct verbal communication with the patient was discouraged. It was mandatory for the patient to wear a facemask and sterilize their hands before entering the procedure room. The procedure area was also properly sanitized. Once the smears were prepared air-drying was avoided to prevent aerosol or droplet generation. While microscopic analysis the reporting pathologist wore gloves and facemask.

During ongoing Corona pandemic there had been a significant reduction (90.8%) in the number of sample received in our facility for cytopathological evaluation. This decrease was due to the postponement of screening activities and clinically benign cases, however, best possible services were continued for oncological patients, both for primary and recurrence diagnosis. There was a relative increase in the breast and lymph node cytology but this increase was not significant, however, there was a significant reduction in thyroid FNA (P -value .025). There was no statistically significant difference in diagnostic category proportions between pre-COVID-19 era and COVID-19 era except for malignant and neoplastic diagnostic categories. There was a significant increase in malignancy rate by 34.1% and reduction in neoplastic category by 23%. This data is probably related to the prevalence of breast samples, also the high capability to identify benign lesions by using imaging allowed to postpone nonurgent breast FNA.

Vigliar et al¹⁰ have published a similar experience from Italy. They documented significant change in almost all the specimen categories as opposed to ours, where it was identified only in thyroid specimens with relative nonsignificant increase in breast and lymph nodes FNA. On comparing the diagnostic categories between the two studies, there was significant increase in malignancy in both these studies; however, our study also documented a significant decrease in neoplastic category. Present study also documents that patients visiting for cytological evaluation during COVID-19 lockdown belonged to comparatively older age group.

The primary purpose was the diagnosis of breast cancer or for detection of recurrence.

To conclude, there had been a significant reduction in number of samples in COVID era. Breast samples remained the most frequent sample type both in pre-COVID-19 as well as COVID-19 periods. Prioritization of the samples, proper precaution and triaging of patients before procedure, can help in carrying out this procedure safely.

CONFLICT OF INTEREST

There is no conflict of interest.

AUTHOR CONTRIBUTIONS

C.R.: concepts, design, definition of intellectual content, literature search, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing, manuscript review, guarantor. S.K.: data acquisition, data analysis, statistical analysis, manuscript editing, manuscript review, guarantor. S.B.: manuscript editing, manuscript review, guarantor. R.K.: statistical analysis, manuscript editing, manuscript review, guarantor. U.S.S.: manuscript editing, manuscript review, guarantor. P.R., K.S., A.M.: data acquisition, manuscript review, guarantor.

DATA AVAILABILITY STATEMENT

data will be provided on request

ETHICS STATEMENT

The study is in accordance with the institutional ethical committee.

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